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(71)Applicant : DAIKEN KAGAKU KOGYO KK
(72)Inventor : HARADA AKIO
UEDA KENZO

(54) ELECTRICALLY-CONDUCTIVE COATING COMPOUND FOR ELECTRODE AND ITS PRODUCTION

(57)Abstract:
PURPOSE: To obtain the subject composition useful as a laminated ceramic condenser, etc., capable of preventing shrinkage of an electrode, aggregation of electrically-conductive powder and deficiency in capacity of a condenser, comprising electrically-conductive powder prepared by specific treatment followed by baking arid an organic vehicle.
CONSTITUTION: This composition comprises (A) electrically-conductive powder prepared by surface treatment with a titanium alkoxide and/or a barium alkoxide and then baking at 50-300°C preferably 100-200°C and (B) an organic vehicle (e.g. methyl cellulose or acrylic resin). In the component A, 100 pts.wt. of the electrically-conductive powder is preferably mixed with 0.1-5 pts.wt., calculated as a metal of the metal, alkoxide, and heated and baked. The amount of the component A is 30-80wt.%, preferably 40-60wt.% and that of the component B is 2-40wt.%, preferably 3-20wt.% of the component B based on the whole amount of the electrically-conductive coating compound.

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Bibliography.

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(71) [Applicant]
[Identification Number] 591040292.
[Name] Size ****** industrial stock formula company.
[Address] 2-7-19, Hanaten-nishi, Joto-ku, Osaka-shi, Osaka.
(72) [Inventor(s)]
[Name] Harada Akio.
[Address] 2-7-19, Hanaten-nishi, Joto-ku, Osaka-shi, Osaka Inside of a size ****** industrial stock formula company.
(72) [Inventor(s)]
[Name] Ueda Kenzo.
[Address] 2-7-19, Hanaten-nishi, Joto-ku, Osaka-shi, Osaka Inside of a size ****** industrial stock formula company.
(74) [Attorney]
[Patent Attorney]
[Name] Morioka **.

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Summary.

(57) [Abstract]
[Elements of the Invention] After carrying out surface treatment of the conductive paint for electrodes of this invention by the titanium alkoxide and/or the barium alkoxide, it contains the calcinated conductive powder and an organic vehicle.
[Effect] The conductive paint of this invention can prevent contraction of an electrode under what condition. Moreover, condensation of conductive powder can be prevented and the shortage of capacity of a capacitor can be prevented.

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CLAIMS

[Claim(s)]
[Claim 1] The conductive paint for electrodes which comes to contain the calcinated conductive powder and an organic vehicle after carrying out surface treatment by the titanium alkoxide and/or the barium alkoxide.
[Claim 2] The conductive paint for electrodes given in the aforementioned claim 1 by which the front face of conductive powder is covered with 0.1 - 2.0% of the weight of titanium, and/or barium.
[Claim 3] The manufacturing method of the conductive paint for electrodes which calcinates after processing conductive powder using a titanium alkoxide and/or a barium alkoxide, and mixes the obtained conductive powder with an organic vehicle.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the conductive paint for electrodes used for the conductive paint for electrodes and other ceramics which are used for the internal electrode of a stacked type ceramic condenser, and its manufacturing method. Furthermore, this invention relates to the conductive paint for electrodes used for electrodes, such as a stacked type ceramic condenser, a laminating ceramic L chip or a laminating ceramic substrate actuator, and ceramic base wiring, and its manufacturing method in detail.
[0002]
[Description of the Prior Art] Conventionally, generally the sheet method and the printing method are known as a method of manufacturing a stacked type ceramic condenser. An external electrode is prepared, after forming a dozens of layers layered product for non-calcinated a ceramic derivative layer and an internal-electrode layer in piles by turns and sintering this at an elevated temperature, even if it is which manufacturing method.
[0003] The dielectric paste which was mixed with the organic binder and slurred ceramic powder, such as a compound perovskite containing a barium titanate, titanium oxide, and lead, is used for the ceramic derivative layer of such a capacitor. In order to form a dielectric layer, this paste is fabricated by methods, such as a doctor blade method, in the shape of a sheet.
[0004] The conductive paint which blended the inorganic-oxide additive with conductive powder, such as platinum, palladium, silver, nickel, copper or such mixture, and an alloy, as an internal-electrode material if needed, and the organic vehicle was made to distribute on the other hand, and was paint-ized is used.
[0005] Usually, such a conductive paint is screen-stenciled on the derivative sheet which is not calcinated [aforementioned], and an internal electrode is formed, and after carrying out pressing of two or more [of these] in piles and cutting to the piece of a chip, it considers as the capacitor element pack of the structure unified by calcinating by the predetermined profile.
[0006]
[Problem(s) to be Solved by the Invention] Baking of such a raw multilayer ceramic capacitor shrinks an internal-electrode layer more greatly than a ceramic derivative layer. For this reason, an internal electrode may serve as the interior from a dielectric terminal, it may become inadequate contacting an external terminal, and **** of an electrode may occur. Moreover, in the conventional conductive paint, by sintering [near the melting point of a conductive metal], condensation of conductive powder takes place, electrode area becomes narrow, and the fall of capacity is produced.
[0007] The purpose of this invention is to offer the conductive paint which ****** (contraction) of the electrode at the time of sintering of a multilayer ceramic capacitor does not produce. Moreover, this invention is to offer the heat-resistant conductive paint which can prevent condensation of conductive powder and can prevent the shortage of capacity of a capacitor.
[0008]
[Means for Solving the Problem] After carrying out surface treatment of this invention by the titanium alkoxide and/or the barium alkoxide, it offers the conductive paint for electrodes which comes to contain the calcinated conductive powder and an organic vehicle, and its manufacturing method.
[0009] Each well-known thing may be used for the conductive powder used for the conductive paint of this invention in this kind of conductive paint. For example, the powder of the powder of noble metals,

such as silver, platinum, gold, palladium, a silver-palladium alloy, and a ruthenium, nickel, copper, or these alloys etc. is mentioned. These are independent, or may mix and use two or more sorts. The amount of the conductive powder used is 40 - 60 % of the weight preferably 30 to 80% of the weight to the conductive-paint whole quantity.

[0010] After processing conductive powder by the metal alkoxide, it is preferably calcinated at 100-200 degrees C 50-300 degrees C. As this metal alkoxide, barium alkoxides or such mixture, such as titanium alkoxides, such as tetrapod alkoxy titanium, and diethoxy barium, are used.

[0011] In order to process conductive powder by the metal alkoxide, the metal alkoxide about 0.1 - 5 weight section is mixed by metal conversion to the conductive powder 100 weight section, and 50-300 degrees C is preferably heated and calcinated at 100-200 degrees C. The metal component of a metal alkoxide remains in the front face of the obtained conductive powder. Thus, as for the metal component on the obtained conductive powder, it is desirable that it is a 0.1 - 2.0 weight section grade in metal conversion to the conductive powder 100 weight section. The contraction of an electrode will become large if there is less metaled covering or metaled coating weight than this. Moreover, resistance will become large if [than this] more.

[0012] Although not limited, especially the method of covering processing can be covered with dry process by carrying out initial-complement dropping of the metal alkoxide, and mixing, for example, after carrying out preliminary mixture of the conductive powder in a mixer. Moreover, in a wet method, initial-complement dropping of the metal organic compound is carried out distributing water, an organic solvent, etc. and agitating conductive powder enough, and there are methods of having carried out filtration dryness after that, or having made the solution of a metal organic compound carry out mixed distribution of the conductive powder, such as carrying out post-filtration dryness.

[0013] There is especially no limit in the organic vehicle used by this invention. Each of binder resins used for internal-electrode paints, such as a well-known multilayer ceramic capacitor (chip capacitor), a laminating L chip, and a laminating ceramic substrate bitter taste tutor, and solvents can be used.

[0014] As such a binder resin, a methyl cellulose, an ethyl cellulose, a nitrocellulose, acrylic resin, alkyd resin, a saturated-polyester resin, a butyral resin, a polyvinyl pyrrolidone, etc. are used, for example. The loadings of this resin are 3 - 20 % of the weight preferably two to 40% of the weight to the conductive-paint whole quantity.

[0015] As a solvent used for a conductive paint, proper solvents, such as a butyl cellosolve, a butyl carbitol, a cyclohexanone, a terpineol, and butyl carbitol acetate, are used to a methyl cellulose and an ethyl cellulose as usual.

[0016] Moreover, in order to raise adhesion to these conductive paints, you may blend a glass frit further. As this glass frit, each well-known glass frit, such as a hoe silicic-acid lead system, a hoe silicic-acid bismuth system, a lead-oxide system, a bismuth-oxide system, and a silicon oxide system, is used. You may add various kinds of plasticizers, such as a dioctyl phthalate (DOP) and diethyl phthalate (DEP), or an additive to the paste used for this invention further.

[0017] In addition, you may carry out mixed combination of the further various metal alkoxides as it is at the paint of this invention. It is such. As an alkoxide, although the alkoxide of various kinds of metals, such as a zirconium, magnesium, a potassium, sodium, and titanium, is used, the alkoxide of a zirconium is desirable.

[0018] In order to prepare the conductive paint of this invention, a resin may be added to the conductive powder which carried out surface treatment by the organometallic compound as aforementioned, and, subsequently mixed distribution may be carried out with a solvent, or conductive powder may be made to carry out mixed distribution of a resin and the solvent at once.

[0019] In order to manufacture a multilayer ceramic capacitor using the conductive paint of this invention, each well-known method, such as the sheet method and print processes, may be used conventionally. As a dielectric paint used here, the well-known thing containing dielectric powder, such as a barium-titanate system, a titanic-acid lead zirconate system, and a bismuth system, a binder resin, and a solvent may be used conventionally.

[0020] In addition, thermal resistance of suppress [a metal organic compound / contraction of an

electrode] improves with the titanium which covered conductive powder, barium, and its oxide, and it is presumed to be what suppresses contraction.
[0021]
[Example] this invention is explained still more concretely based on an example below. In an example and the example of comparison, the section means the weight section.
[0022] The [example 1] tetrapod alkoxy titanium 10 section (metal conversion 0.5 section) and the diethoxy barium 1.36 section (metal conversion 0.5 section) were mixed, subsequently the palladium powder 100 section was supplied, and it fully agitated. This mixed liquor was dried, volatile matter was removed, it calcinated at 200 more degrees C, and the conductive powder in which titanium and barium carried out 1 weight section covering by metal conversion was obtained on the front face of palladium powder.
[0023] Thus, 3 rolls were used, the obtained conductive powder and the following component were mixed and distributed, and the conductive paint was prepared by the conventional method.
[0024]
Palladium powder which carried out surface treatment 100 weight sections ethyl cellulose 5 weight sections terpineol The conductive paint was prepared like the example 1 except having used the 100 section as 30 weight sections [example 2] conductivity powder in the end of silver dust.
[0025] The conductive paint was prepared like the example 1 except having used the Ag-Pd alloy 100 section as [example 3] conductivity powder.
[0026] The conductive paint was prepared like the example 1 except having not processed the [example 1 of comparison] conductivity powder by the organometallic compound.
[0027] The conductive paint was prepared like the example 2 except having not processed the [example 2 of comparison] conductivity powder by the organometallic compound.
[0028] The conductive paint was prepared like the example 3 except having not processed the [example 2 of comparison] conductivity powder by the organometallic compound.
[0029] On the [example of examination] glass plate (30cmx30cm), the cellophane tape was used and the PET film with a width-of-face [of 10cm] x length of 25cm was stuck. About 8-10g of each paste obtained in the example and the example of comparison was applied using the applicator on this PET film (five pieces each). Subsequently, it dried for 120**15 minutes at 100 degrees C. After dryness, after 2 hours or more passed, the electrode sheet was stripped and it cut from the PET film in the fixed size. This was calcinated [example / 1 / the example 1 and / of comparison] at 900 degrees C about 1100 degrees C, the example 2, and the example 2 of comparison. The size after baking was measured and the shrinking percentage was computed by the following formula. The average of the measurement result of five test pieces is shown below.
[0030] Shrinking percentage = (size before size-baking after baking) size before x100-/baking ---------- Average shrinking percentage (-%)
---------- . An example 1 24 ** 2 6 ** 3 18 ---------- Example 1 of comparison 27 ** 2 18 ** 3 26 ----------. [0031]
[Effect of the Invention] Even if the conventional internal-electrode material controlled baking conditions etc. severely, its contraction was larger than the ceramic derivative, the contact to an external electrode terminal was missing, and the poor contact generated it. On the other hand, in the conductive paint of this invention, contraction of an electrode can be effectively prevented under what condition by having processed conductive powder by the metal alkoxide. Moreover, condensation of conductive powder can be prevented and the shortage of capacity of a capacitor can be prevented.

[Translation done.]